18. The method of Claim 16, wherein the step b) is conducted with the temperature of the substrate kept at about 600°C or lower.

19. The method of Claim 18, wherein the step b) is conducted in an ambient of plasma.

20. The method of Claim 19, wherein the plasma comprises nitrogen plasma.

21. The method of Claim 16, further comprising the step of c) forming a p-side electrode out of a metal on the semiconductor layer after the step b) has been performed.

22. The method of Claim 21, wherein the step c) comprises annealing the p-side electrode at about 400°C or lower after the p-side electrode has been formed.

23. The method of Claim 22, wherein the step c) comprises exposing the semiconductor layer to a plasma after the p-side electrode has been formed.

24. The method of Claim 16, wherein the dopant is selected from the group consisting of magnesium, zinc, calcium, strontium, beryllium, cadmium, mercury and lithium.

25. A method for fabricating a semiconductor device, comprising the steps of:

a) forming a semiconductor layer of a Group III nitride containing a dopant over a substrate;

b) forming a p-side electrode out of a metal on the semiconductor layer; and

c) applying RF power on the semiconductor layer, thereby making the conductivity type of the semiconductor layer p-type.

26. The method of Claim 25, wherein the step b) is conducted with the temperature of the substrate kept at about 600°C or lower.

27. The method of Claim 25, wherein the metal is selected from the group consisting of nickel, iron, copper, chromium, tantalum, vanadium, manganese, aluminum, silver, palladium, iridium, gold or platinum.

28. The method of Claim 25, wherein the metal is a hydrogen-storing metal selected from the group consisting of titanium, magnesium, calcium, zirconium, lanthanum, niobium, vanadium, nickel, iron, manganese, cobalt, chromium and aluminum.

29. The method of Claim 25, wherein the step b) comprises forming a hydrogen-absorbing layer out of a hydrogen-storing metal on the semiconductor layer before the p-side electrode is formed.

30. The method of Claim 29, wherein the hydrogen-storing metal is selected from the group consisting of titanium, magnesium, calcium, zirconium, lanthanum, niobium, vanadium, nickel, iron, manganese, cobalt, chromium and aluminum.

31. The method of Claim 25, wherein the step c) is conducted in an ambient of plasma.

32. The method of Claim 31, wherein the ambient of plasma comprises nitrogen plasma.

33. A method for fabricating a semiconductor device, comprising the steps of:

a) forming a semiconductor layer of a Group III nitride containing a dopant over a substrate; and

b) after introducing the substrate into a vacuum chamber, charging plasma into the vacuum chamber to form an ambient of plasma while keeping the temperature of the substrate at about 600°C or lower, thereby making the conductivity type of the semiconductor layer p-type.

34. The method of Claim 33, wherein the ambient of plasma comprises nitrogen plasma.

35. The method of Claim 33, further comprising the step of c) forming a p-side electrode out of a metal on the semiconductor layer after the step b) has been performed.

36. The method of Claim 35, wherein the step c) comprises annealing the p-side electrode at about 400°C or lower after the p-side electrode has been formed.

37. The method of Claim 36, wherein the step c) comprises exposing the semiconductor layer to a plasma after the p-side electrode has been formed.

38. The method of Claim 33, wherein the dopant is selected from the group consisting of magnesium, zinc, calcium, strontium, beryllium, cadmium, mercury and lithium.

39. A method for fabricating a semiconductor device, comprising the steps of:

a) forming a semiconductor layer of a Group III nitride containing a dopant over a substrate;

b) forming a p-side electrode out of a metal on the semiconductor layer; and

c) after introducing the substrate into a vacuum chamber, charging plasma into the vacuum chamber to form an ambient of plasma while keeping the temperature of the substrate at about 600°C or lower, thereby making the conductivity type of the semiconductor layer p-type.

40. The method of Claim 39, wherein the metal is selected from the group consisting of nickel, iron, copper, chromium, tantalum, vanadium, manganese, aluminum, silver, palladium, iridium, gold or platinum.

41. The method of Claim 39, wherein the metal is a hydrogen-storing metal selected from the group consisting of titanium, magnesium, calcium, zirconium,

lanthanum, niobium, vanadium, nickel, iron, manganese, cobalt, chromium and aluminum.

42. The method of Claim 39, wherein the step b) comprises forming a hydrogen-absorbing layer out of a hydrogen-storing metal on the semiconductor layer before the p-side electrode is formed.

43. The method of Claim 42, wherein the hydrogen-storing metal is selected from the group consisting of titanium, magnesium, calcium, zirconium, lanthanum, niobium, vanadium, nickel, iron, manganese, cobalt, chromium and aluminum.